Observations of Jupiter during the Present Opposition.—M. P. Vincart, of Antwerp, to whom we referred in our issue of January 16 (No. 1994, p. 259) as having made his own reflector, describes his more recent observations of Jupiter in No. 3 of the *Gazette Astronomique* (p. 27). On February 5 the shadow of the fourth satellite, projected on to the bay of the Red Spot, appeared elongated, and was encircled by a brilliant halo where it came in contact with the Red Spot. On February 13, despite prolonged attention, M. Vincart was unable to find the least trace of the regular markings recently described by Mr. Bolton.

M. Vincart states that with his instrument he is able to separate, clearly, the components of γ^2 Andromedæ, whilst with the naked eye he is able to count thirteen stars in the Pleiades and to see Jupiter's third satellite when at its elongations.

Recent Observations of Venus.—The third number of the *Gazette Astronomique* (February 29, p. 21) contains an interesting description, by Mr. J. M. Harg, of Lisburn, Ireland, of his recent observations of Venus, made with refractors of 104 mm. and 123 mm. aperture, and using a magnifying power of 200. Four sets of markings were recognised from time to time during the period December 29 to January 20, and are illustrated by the drawings accompanying the note. The first, in longitude 180°, is a long oblique shadow; the second is in longitude 270°, and is an irregularly shaped marking showing numerous details in its outline; the third is a doubtfully permanent, double marking in longitude 0°; and the fourth is of a curiously bent form in longitude 90°. Mr. Harg's observations indicate that the rotation period does not exceed 23h. 28m.

The System of ζ Ursæ Majoris (Mizar).—Prof. Frost, in a brief note communicated to No. 4235 of the *Astronomische Nachrichten* (p 171, February 29), confirms Dr. Ludendorff's observation of the variable radial velocity of the fainter component of ζ Ursæ Majoris, but states that the Yerkes spectrograms show a greater range of velocity, varying from -17 km. to $+10$ km. per second; the period of the variation cannot yet be stated.

The plates of Alcor, the naked-eye companion to Mizar, show that the radial velocity of this star also is variable, the changes in the spectrum being so rapid that it has been found necessary to take spectrograms in continuous succession for several hours; it seems probable that the period will be found to be exceedingly short. A qualitative examination of the spectra obtained shows that the 4481 Mg line and the hydrogen lines are sometimes double, sometimes single. The displacement of the 4481 line with respect to the Ti line of nearly the same wave-length also varies considerably.

Mars as the Abode of Life.—The title of Prof. Lowell's article in the March number of the *Century Magazine* is "The Sun Dominant," and in it the author discusses the analogies between areographical and terrestrial conditions. The evolution of the conditions of habitability on the earth is described, and it is shown that the same kind of evolution is probably taking place on Mars. From the fact that the same species of animals, often the same individuals, are able to sustain life under the vastly different conditions of temperature and atmospheric pressure exhibited at various altitudes in the Andes and similar mountain ranges, it is argued that the variations of temperature and the constant lowness of the pressure on Mars should prove no bar to the possibility of living creatures existing there. The presence of water—demonstrated, since the article was written, by Mr. Slipher's spectrograms—and of vegetation are also discussed, and the article concludes with a discussion of the mode in which the presence of organic life is manifested.

The Variable Star 31, 1907, Aurigæ.—A telegram from Prof. Hartwig, published in No. 4238 of the *Astronomische Nachrichten* (p. 223, March 9), states that the variable star 31, 1907, Aurigæ, which he has found to be of the U-Geminorum type, was of the ninth magnitude on March 6, having increased four magnitudes in one day, whilst within eight days it was less than the fourteenth magnitude.

THE CARNEGIE INSTITUTION.

THE "Year-book" for 1907 of the Carnegie Institution of Washington is now available. It contains the minutes of the last meeting of the board of trustees, the reports of the president, Prof. R. S. Woodward, and the executive committee of the institution, and the reports on investigations and projects. The volume, of 230 pages, serves excellently to indicate the admirable work in science which is being done by means of the grants made by the institution. The subjoined summary of the reports shows the position of the institution and some of the directions in which progress was made during the past year.

At the meeting of the board of trustees in December last a letter from Mr. Andrew Carnegie was read announcing his intention to add 400,000*l.* to the endowment of the institution. The financial statement for the year ending October 31, 1907, shows that the assets of the institution, including real estate and equipments, amounted to nearly two and a quarter millions sterling, the endowment being 2,000,000*l.* At this meeting of trustees the following general appropriations were made for the present year:—publication fund, 10,000*l.*; administration, 10,000*l.*; grants for departments and large projects, 75,988*l.*; and for previously implied grants, new minor grants, and research assistants, 10,000*l.*

The report of the president for the financial year 1906–7 shows that the amounts available during that year were:—for large grants, 109,538*l.*; for minor grants, 15,226*l.*; for research assistants, 5080*l.*; and for publication, 16,400*l.* The aggregate receipts from interest on endowment, interest on deposits in banks, sales of publications, and miscellaneous items, amounted to 578,274*l.*

From the income of the institution during the last six years there has been spent, for large projects, 240,462*l.*; for minor and special projects, 138,530*l.*; and for publication, 28,117*l.* The gross sums allotted to large projects since the organisation of the institution amounted to 271,237*l.*, and for minor projects and research assistants to 156,936*l.*

The report of the president also summarises the work of the various departments of the institution. The department of botanical research is engaged on a series of problems the elucidation of which cannot fail to be of the greatest interest and value, whether applied to the restricted field of botany or to the broader domain of biology. By means of observation, experiment, and measurement it is proposed to determine, as nearly as may be, the conditions of development, growth, distribution, migration, and variation of desert plants. Thus, in addition to systematic studies of the forms and distribution of these plants, there must be carried on studies of the factors of temperature, rainfall, evaporation, soil moisture, and anatomical and physiological adaptability. The location of the desert laboratory in a country affording a wide range of plant-forms, as well as a wide range of conditions in altitude, temperature, soil-moisture and soil-composition, presents unequalled opportunities for such studies. Along with these lines of work, the anatomical, physical, and physiological researches of the department staff have already resulted in noteworthy contributions to biological science.

The work of the department of experimental evolution is progressing favourably along lines explained in preceding reports, the principal problems under investigation being those of heredity in plants and animals.

The completion and occupancy of the geophysical laboratory mark a noteworthy advance in the progress of the novel and difficult experimental work carried on in this department of research.

The experiments and investigations of Mr. Luther Burbank in horticulture, and the work of preparing a scientific account of his methods and achievements, are progressing as favourably as the available division of time and labour will permit.

During the season under review, as hitherto, the department of marine biology has extended its laboratory and collecting facilities to specialists in zoological research, eleven such guests having availed themselves of the opportunities afforded at Dry Tortugas and in the adjacent regions accessible by means of the vessels of the department.

The work of the department of meridian astrometry during the year was mainly devoted to preparations for its larger enterprise of a comprehensive catalogue giving accurate positions of all stars from the brightest to the seventh magnitude, inclusive. Amongst these preparations is a preliminary catalogue, embracing the precise positions for upwards of 6000 stars, which has been brought to substantial completion during the year. This will not only be of great service to the department, but it will be of signal aid also to astronomical science in general. Preparations for the establishment of a temporary observatory in the southern hemisphere are likewise approaching completion. An exhaustive study of the meridian instrument to be used at this observatory has been made, so that its constants and peculiarities may be well known before observations with it are begun.

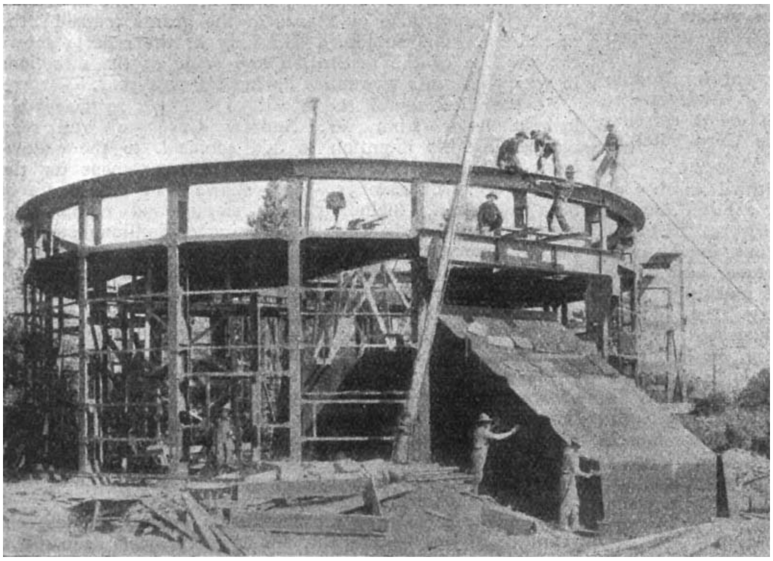

Fig. 1.—Steel Building for 60-inch Reflector, Mount Wilson Solar Observatory.

In conformity with the provision made by the board of trustees at its last meeting for the establishment of a laboratory to be devoted especially to an extension of the physical and chemical investigations in nutrition carried on hitherto under the direction of Profs. Atwater and Benedict, steps were taken early in the year to select a suitable site and to prepare tentative plans for the building. Since experiments on men in an abnormal as well as in a normal condition of nutriment are contemplated, one of the first requirements of a site was proximity to hospitals whence pathological cases may be furnished. It was decided to establish the proposed laboratory in the city of Boston, near the power-house of the Harvard Medical School.

The work of the solar observatory is still largely in the preparatory stage, and is thus as much a work of engineering as of astronomy. The novelties of construction, equipment, and programme of research for the observatory, along with the initial difficulties presented by a mountain site, conspire to make the undertaking a formidable one.

The optical parts of the 60-inch reflecting telescope have been made ready for mounting, but owing to the labour strikes at San Francisco the completion of the dome for the telescope may delay its erection until the spring of 1908. The novel tower telescopic apparatus, part of which is above and part below the ground-level, has been substantially completed. This consists essentially of a vertical telescope with a 12-inch objective and 60 feet focal length in combination with a Littrow grating spectrograph of 30 feet focal length, thus furnishing a powerful component in the battery of instruments for direct observations of the sun.

Preparations for grinding, figuring, and testing the 100-inch reflector, the construction of which was rendered possible by the gift of Mr. J. D. Hooker, have likewise gone forward. A fire-proof building for this work has been constructed, and the necessary grinding machine is nearing completion. In the meantime it is expected that the Plate Glass Company of St. Gobain, France, will soon have the large disc for this reflector ready for shipment, since it was successfully cast on August 28 last. In the rough, this disc will weigh about 4·5 tons.

Simultaneously with these varied works of construction, daily photoheliographic and spectroheliographic observations have been made by aid of the Snow telescope. Daily studies of the sun and sun-spot spectra have supplemented these observations, and to them have been added pyrheliometric and solar magnetic measurements, along with numerous laboratory investigations bearing directly on the physical properties of the sun.

The year for the department of terrestrial magnetism has been one of varied activities, and one specially fruitful in the quantity and quality of the results attained. The operations have embraced magnetic surveys of the North Pacific Ocean; surveys on land in Alaska, Bermuda Islands, Canada, Central America, China, Mexico, and South Pacific Islands.

The list of publications issued during the year shows that thirty-eight volumes were published, with an aggregate of 3428 quarto pages and 6284 octavo pages respectively. Moreover, there are now in the press twenty-three volumes. The total cost of completed publications issued during the five years ending with that under review reaches 33,897*l*. As regards the general aspects of this subject, there are indications of over-production in the line

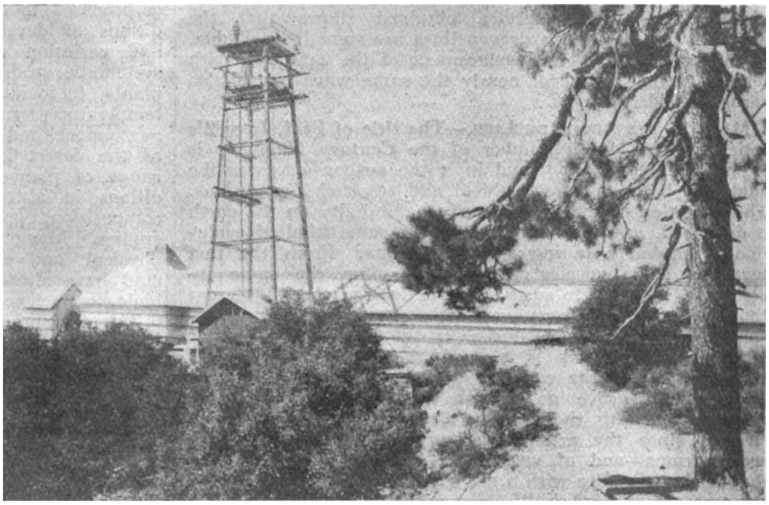

Fig. 2.—Vertical Cœlostat or Tower Telescope, Mount Wilson Solar Observatory.

of scientific publications. The world appears to be accumulating knowledge faster than it can be assimilated. Even by aid of the comprehensive bibliographies now issued, it is difficult, if not impossible, for the specialist to become conversant with the current literature of his own field. On the other hand, the standard of excellence in publications is undoubtedly higher now than at any previous epoch, although it may not have kept pace adequately with the increasing productivity of our times.

SOME LONDON PROBLEMS.

LONDON'S TRAFFIC.

THE deputation a short time ago from Browning Hall to the London County Council, and the numerous references which have been made in Parliament and elsewhere to the question, make it appear likely that before very long steps will be taken by the Government to establish a Traffic Board for London. In fact, the President of the Board of Trade has given us to understand that his department is in favour of it, and that he will endeavour to get the matter settled without delay; for the new Traffic Department of the Board of Trade cannot be anything but a temporary step.

Among the mass of valuable information collected by the last Royal Commission not the least interesting was that dealing with the history of this problem, for the London traffic problem is almost as old as the city itself. From the earliest days London has suffered from the congestion of its narrow streets, arising from the accumulation of traffic and the encroachments of buildings, and just as at the present day so in previous centuries every attempt made to widen individual streets or to provide increased facilities led to such an increase of traffic in that particular avenue as to render the final state of congestion worse than before. Nothing is more characteristic of the traffic problem than this phenomenon, that every increase of facilities produces an increase of traffic, and so on.

Spasmodic attempts had been made by the corporation of London and other bodies to widen streets here and there, and during the earlier part of the seventeenth century several proposals were brought forward, but were shelved owing to the state of politics at the time.

After the Restoration, however, and just before the Great Fire, an Act was passed for repairing and enlarging the streets with the express object of improving traffic, stating that many streets were too narrow for vehicles. It is interesting to note, however, that increased traffic was anticipated, and the Act also provided for the regulation and licensing of hackney carriages; but immediately after came the plague and the fire, after which a new Act was passed. This was London's great opportunity, and both Sir Christopher Wren and John Evelyn brought forward comprehensive schemes for rebuilding. Had either of these been followed, untold millions would have been subsequently saved to London. It would to-day have been one of the most orderly and carefully laid out cities, with great avenues radiating from the centre. Had this taken place the subsequent growth of the suburbs would have naturally followed on the same plan, and the present heterogeneous arrangements of suburban streets would have never grown up.

In the eighteenth century the conditions were very analogous to those of the nineteenth. If we suppose mail coaches for railways, riding horses for bicycles, hackney carriages for cabs and motors, we see that London was even then provided with a considerable variety of means of transport.

The first Parliamentary Committee upon metropolitan traffic met in 1830, the matter being brought into prominence by the imminence of railways being built in the London district. Other committees succeeded, and in 1842 a Royal Commission was appointed under the Earl of Lincoln, the Commissioner of Woods and Forests, as chairman; various improvements were therein suggested, but it was not until 1853 that Parliament gave a definite start to the modern idea of London local government.

In 1845 the need of improved means of locomotion were realised, and no fewer than nineteen Bills were promoted in that year dealing with railways in the metropolitan district, at least one of them containing the suggestions for a metropolitan central station.

Not until 1854, however, did the first underground line from Paddington to Farringdon Street receive Parliamentary sanction. It was opened in 1863, and was followed by the construction of a similar line from Victoria to Kensington in 1868, but the inner circle was not completed until 1884.

LONDON'S PORT.

The chief difficulty under which London suffers in connection with its port, as in connection with so many other matters, arises from its age. It is so much older than its rival ports that steps which are taken by them so as to keep them up to date are rendered far more difficult in the case of London. Nothing is easier than to point to Rotterdam or Liverpool as examples of what might be done, but those who do so too often forget the fact that the Port of London has a history of 500 years, compared with less than a century of serious trading in those other ports. The Port of London question is a good, nay, one of the best, examples of the truth that "circumstances alter cases."

The result is that there are an inordinate number of authorities concerned in dealing with the question, and an inordinate number of vested interests to be considered. Moreover, the conditions of transport have changed very materially. In the Middle Ages London was the *entrepôt* for the whole of western Europe. The East Indiamen unloaded there, and their cargoes were distributed by smaller vessels over the whole of western Europe. At the beginning of the nineteenth century, however, trade began to go to other ports. The rise of Liverpool, Glasgow, Hamburg, Antwerp, &c., means that the population surrounding those ports are now no longer supplied from London. Nevertheless, the great increase of population in London itself and all England as a whole, maintains the actual amount of traffic coming into London at its former figure, and London acts as a distributing centre for 10,000,000 to 12,000,000 persons.

The control of the Thames is in the hands of the Thames Conservancy, the dock companies, the Trinity House, the Corporation of the City of London, and the County Council, while the wharfingers and lightermen also have most important interests.

In Liverpool, on the other hand, or in Glasgow, the Harbour Trust has practically a monopoly of authority, and this enables a policy to be adopted which is far less trammelled by outside interference.

Certain of the docks in London are so old that it is impossible to think of modernising them in any way, but the India Docks could undoubtedly be very much improved, while the Tilbury Docks are said to be capable of docking nearly any ship at present afloat. The problem of docking, however, is one that has to be constantly altering on account of the growth of steamships. Hence docks, if they be large enough to-day, would, in a few years' time, be too small, and any docks which are now constructed, in order to have something in hand, need to be of the order of 1000 feet in length. It is not, however, in length that the docks are so much lacking in London, but in the depth of the sills, which render it impossible for vessels of more than 30 feet to enter, for the Royal Albert Dock can take ships up to 536 feet long.

New York and Boston are arranging for 40-feet channels into their ports and steamers are to-day leaving Baltimore loaded down to 32 feet, whereas, at the present time, a ship drawing only 28 feet may be delayed for five hours in the Thames on any day.

What is really wanted is a channel at least 30 feet deep at low tide and 1000 feet wide, as far as the Albert Dock gates, and 1000 feet is not at all too wide to allow a 750-feet vessel to be turned.

Numbers of schemes are constantly being brought out dealing with the port, such as the Thames Barrage Scheme of last year, in which the whole river was to be docked